A Changing Environment:

Are firms shifting attention to regulation of nanotechnology?

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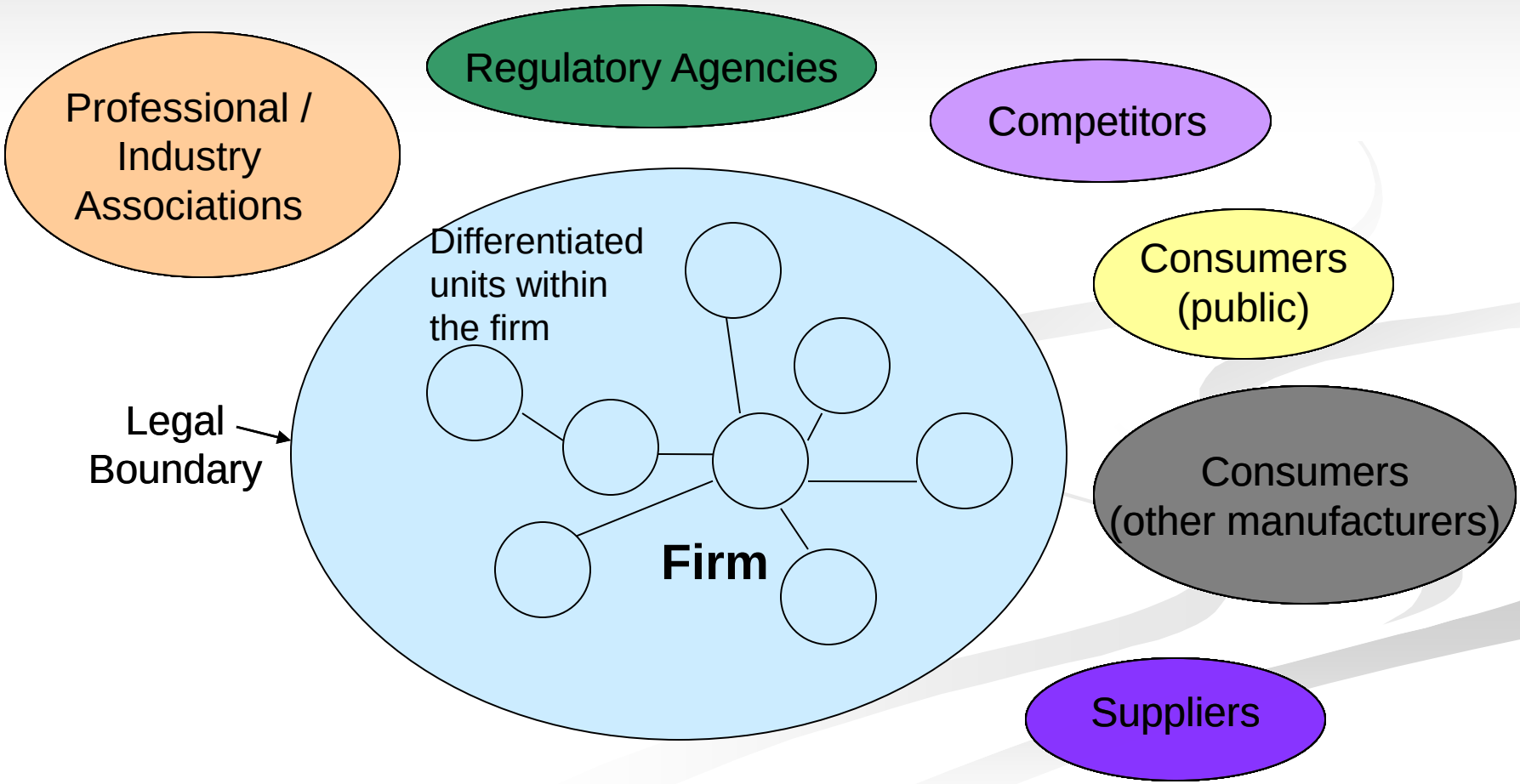
Nanotechnology & Society

- Why is this area of study important?
- What do we hope to learn from this type of research?
  - How external environments shape nanotech firms' activities
  - Why firms are responding to the environment in the ways observed
  - How the regulatory environment is being shaped by firms' responses

Organizational Theory

- Organizations
  - Boundaries
  - Environment
  - Buffering
- Social, cultural, regulatory and political environments

Organizational Environment



Organizational Environment

- Development has far outpaced risk assessment and materials characterization
  - Over 1,000 consumer products incorporating nanotechnology
  - Environmental and health risk assessment

Organizational Environment

- Public response to nano
  - Public surveys of nano knowledge
  - NanoTex
  - Magic Nano

Organizational Environment

- Local government regulations
- Federal and state regulations

Research Questions

- How is this external environment shaping firm activity both inside and outside the firm?
- Why are firms responding to the environment in the ways observed?
- How is the regulatory environment being shaped by firms' responses?

Research Methods

- Survey instrument
- Population
- Data collection

Survey Instrument

Four main sections, 40 questions total

- Screening questions (UML 2006)
- Acquiring patented technology (AAAS 2007)
- Environmental Health & Safety

Population

Massachusetts-based firms engaged in research, manufacture or use of nanoscale materials or processes

Listed in Nanobank with article author, patent assignee, and grantee organization identified as a “firm”

AND

Listed in Dun & Bradstreet Million Dollar Database (U.S. businesses with $5 million+ sales or 65+ total employees, plus branches with 500+ employees this site)

Population

- N = 224
- Biggest worry was non-response
  - UML (2006) response rate = 33%
  - NCMS (2006) 10%
  - AAAS (2007) 27%
  - NOS (2002) 62.4%
  - ICON (2006) 33%

Data Collection

- Pre-survey letter
- Multi-method (web and telephone survey)
- Extensive email and telephone follow up
- Incentive
- Final response rate – 72.32% (85 firms)

Data Collection

- Survey data is linked to secondary data
  - Nanobank (formation of collaborations and impact on organization structure)
  - D&B (relationship between firm demographics and response to organizational environment)

Results

Variable	N	Mean	Std Dev	Min	Max
Annual Sales	44	$794M	$3,110M	$1.78M	$20.3B
Employment	44	495	1,203	10	7,000
3yr Employment Change	42	22	130	-60	823
Plant Facility Size (sq ft)	42	136,645	233,860	5,000	1,200,000
Year Established	44	1971	34.9	1811	2003
Location Type—Headquarters	44	70.45%			
Global Market	85	82.35%			
Foreign Competition	85	88.24%			
Boston Metro Area	44	72.73%			
Main R&D Source					
Internal R&D	48	55.47%			
Industry Suppliers	17	20.00%			
Academic	6	7.06%			
Government	4	4.71%			
Independent Contractor	3	3.53%			

Results

How is the external environment shaping firm activity?

- **No external influence on nanotech activity**
- Influence from suppliers and consumers
- Influence from regulatory agencies
- Influence from the public

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Discussion

- The survey data is rich in information on how firms are responding to nano

- Organizational size is positively related to complexity (Blau, 1973; Blau & Schoenherr, 1971; Meyer, 1972).

Discussion

- Why are firms responding to the environment in the ways observed?

- Training and education
  - Pre-emptive involvement in creation of regulations

Discussion

How is the regulatory environment being shaped by firms' responses?

Questions?

For more information about this research…

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